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Industrial R&D statistics by region, 1994 to 2002

by Robert Schellings

Science, Innovation and Electronic Information Division (SIED)
7-A, R.H. Coats Building, Ottawa, K1A 0T6

Telephone: 1 800 263-1136

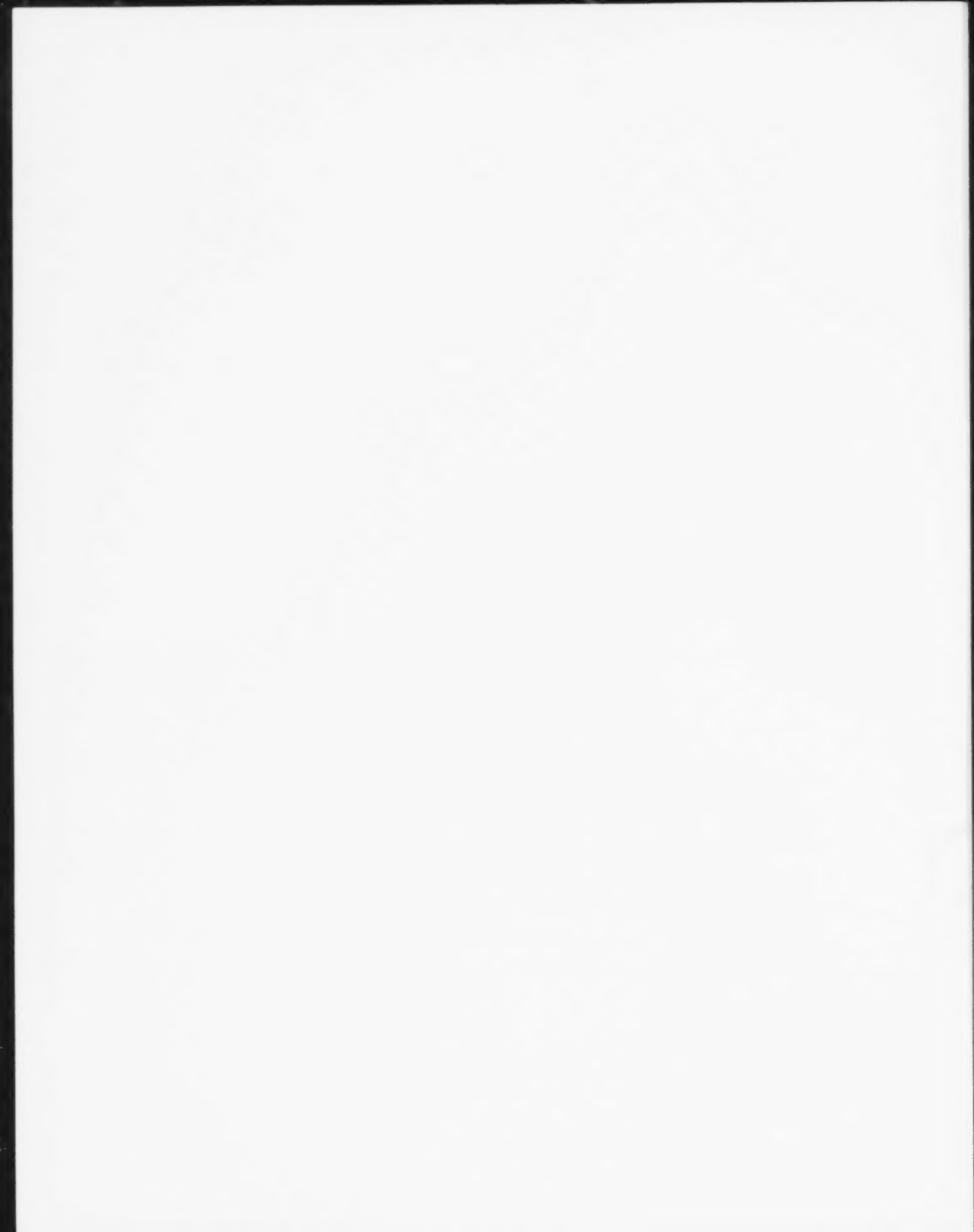
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Prepared by:

Robert Schellings
Science and Innovation Surveys Section
Science, Innovation and Electronic Information Division (SIEID)
Statistics Canada

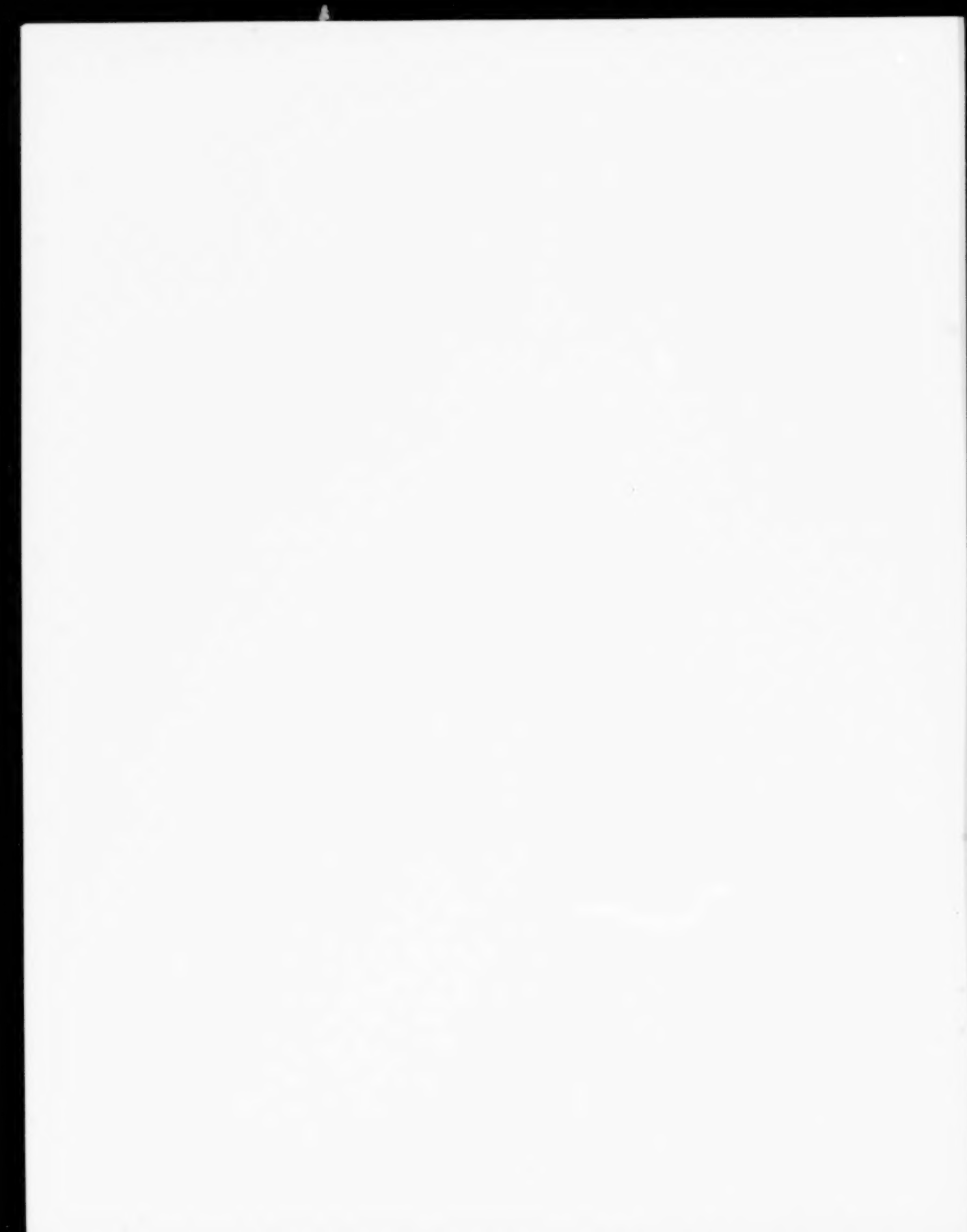


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Foreword

The purpose of this working paper is to provide regional data on business enterprise research and development (R&D) activity. The degree of details is strictly limited due to confidentiality restraints imposed by the Statistics Act. Data are presented on R&D expenditures and personnel, by country of control, data source, employment size and R&D size.

Innovation is essential to economic progress. Properly applied in developing new products and services, innovation may also conserve resources, preserve the environment, and add to our quality of life. The innovation process involves a number of elements concerned with the generation, dissemination and application of new knowledge: R&D to provide new ideas; education and information services to develop the required personnel; and design, engineering and marketing services to incorporate the new ideas into the production and distribution systems.

R&D statistics, therefore, measure only part of the effort necessary for innovation. However, R&D is at the heart of the innovation process.

While R&D is also carried out by other sectors, such as governments and universities, industrial R&D is most clearly linked to technological innovation and, hence, economic growth. Canada does not, of course, rely only on domestic R&D for new ideas and innovation. A great deal of information comes from abroad in the form of information embodied in new machinery and equipment, in the minds of scientists and engineers, in scientific and technical journals, and in designs, drawings, tooling and manufacturing specifications. Some data are presented on the acquisition of R&D from abroad, but much of the flow of technological information cannot be measured.

In many ways it is more efficient to acquire the results of R&D performed by others since the cost of securing such information is usually less than the cost of duplicating it. However, some domestic R&D is necessary not only to ensure that new inventions are appropriate to Canadian production and marketing conditions, but also to ensure that foreign R&D can be properly assimilated, i.e., understood and adapted. It also provides Canadian firms with a better bargaining position for exchanges of technological information. Domestic performance of R&D is therefore necessary, even if we wish only to be effective imitators and adapters.

Statistics Canada has collected data on R&D in Canadian industry for 48 years. Maintaining the continuity and comparability of these data over time is of considerable importance. This working paper is a summary of provincial industrial R&D activities. It presents historical and current statistical information on industrial research and development activities for the years 1994 to 2002.

In 1999 a new methodology was introduced for estimating R&D expenditure in the business sector in Canada. The new approach substitutes the use of administrative data from the Canada Revenue Agency (CRA), in place of survey data, for any firm funding or performing less than \$1 million worth of R&D. This enabled the elimination of over 10,000 survey form mail-outs, thus reducing survey reporting burden.

Firms that perform or fund R&D in Canada apply for a tax credit to the CRA, under the Scientific Research and Experimental Development (SR&ED) program. Under the current regulations, the filing must take place within 18 months of the expenditure. Once the claims are submitted, they are processed and forwarded to Statistics Canada. This means that data can arrive up to two years after the expenditure was made.

As timely data on R&D activities are valued by people in all economic sectors, the release of the estimates in the past was governed by survey data for firms spending more than \$1 million on R&D. We are now releasing the survey results with available data from the CRA records, including revisions for past years.

The use of CRA data results in a small understatement of total R&D activities for the most recent years reported. This is explained fully in the notes in the Statistics Canada catalogue no. 88-202-XIE.

Table values presented in this publication do not reflect any underestimates due to the volatility of the universe of small enterprises submitting SR&ED claims. The reason for the understatement is the different time for the collection of the survey and the administrative data. The survey collects data on four years, and it does so every year. The four years are: the previous year, for which the data are expected to be final; the actual survey year, for which the data are expected to be close to final; the year in which the questionnaire is mailed, for which the data are planned expenditures; and the next year, for which the data are a forecast of spending intentions. CRA collects data only on actual expenditures and it allows 18 months for the submission. This means that when survey data are ready for publication, not all of the CRA data for that year will have been received. Experience since 1997 shows that this amounts to an understatement of between 5-7% of the total value of expenditures. The figures for 2002 are published as actual expenditures in 2004, along with the preliminary figures for 2003 and the spending intentions for 2004. However, the figures for 2002 will be revised when they are published again in 2005 and 2006 to take this understatement into account. A similar understatement of 11% occurs in the personnel data.

This report was prepared Robert Schellings, Subject Matter Manager of Science, Innovation and Electronic Information Division.

Symbols used in this report:

The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- ^p preliminary
- ^r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- ^E use with caution
- F too unreliable to be published

Note

Due to rounding, components may not add to the totals.

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Counts of industrial R&D performers, by region

Table 1 – Counts of industrial R&D performers by data source, Canada and the regions

Region / Data source		1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
Canada ¹	Survey	1,147	1,260	977	939	916	983	1,120	1,212	1,154
	CRA	9,985	9,511	8,828	8,711	8,869	8,985	9,733	10,225	7,738
	Total	11,132	10,771	9,805	9,650	9,785	9,968	10,853	11,437	8,892
Atlantic Canada	Survey	76	81	65	72	79	88	107	97	89
	CRA	387	437	475	444	458	417	396	338	209
	Total	463	518	540	516	537	505	503	435	298
Quebec	Survey	364	390	328	308	322	343	399	425	423
	CRA	3,354	3,420	3,536	3,540	3,694	3,819	4,194	4,532	3,713
	Total	3,718	3,810	3,864	3,848	4,016	4,162	4,593	4,957	4,136
Ontario	Survey	608	665	523	522	519	545	614	658	641
	CRA	3,484	3,210	2,845	2,889	2,926	2,950	3,198	3,368	2,400
	Total	4,092	3,875	3,368	3,411	3,445	3,495	3,812	4,026	3,041
Manitoba and Saskatchewan	Survey	102	100	87	89	87	90	96	99	97
	CRA	441	382	318	312	310	309	336	325	234
	Total	543	482	405	401	397	399	432	424	331
Alberta	Survey	118	126	109	99	92	101	99	110	113
	CRA	875	808	702	656	660	665	712	711	484
	Total	993	934	811	755	752	766	811	821	597
British Columbia	Survey	170	163	120	123	126	143	165	158	147
	CRA	1,403	1,231	945	865	814	821	894	949	697
	Total	1,573	1,394	1,065	988	940	964	1,059	1,107	844

1. Canada totals include the Territories

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 2 – Counts of industrial R&D performers by country of control, Canada and the regions										
Region/ Country of control		1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
Canada ¹	Canada	10,573	10,208	9,272	9,110	9,317	9,543	10,420	11,003	8,524
	Foreign	559	563	533	540	468	425	433	434	368
	Total	11,132	10,771	9,805	9,650	9,785	9,968	10,853	11,437	8,892
Atlantic Canada	Canada	433	483	507	471	483	446	430	371	239
	Foreign	30	35	33	45	54	59	1	64	59
	Total	463	518	540	516	537	505	503	435	298
Quebec	Canada	3,551	3,641	3,671	3,662	3,848	4,009	4,412	4,775	3,989
	Foreign	167	169	193	186	168	153	181	182	147
	Total	3,718	3,810	3,864	3,848	4,016	4,162	4,593	4,957	4,136
Ontario	Canada	3,739	3,535	3,081	3,102	3,187	3,249	3,575	3,797	2,816
	Foreign	353	340	287	309	258	246	237	229	225
	Total	4,092	3,875	3,368	3,411	3,445	3,495	3,812	4,026	3,041
Manitoba and Saskatchewan	Canada	488	428	354	352	351	347	378	369	276
	Foreign	55	54	51	49	46	52	54	55	55
	Total	543	482	405	401	397	399	432	424	331
Alberta	Canada	945	881	757	700	694	712	761	774	552
	Foreign	48	53	54	55	58	54	50	47	45
	Total	993	934	811	755	752	766	811	821	597
British Columbia	Canada	1,497	1,328	1,006	934	882	910	997	1,050	798
	Foreign	76	66	59	54	58	54	62	57	46
	Total	1,573	1,394	1,065	988	940	964	1,059	1,107	844

1. Canada totals include the Territories

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 3 – Counts of industrial R&D performers by employment size – Canada¹

Employment size ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of enterprises								
0 – 9	4,812	4,472	4,133	3,937	3,817	3,803	4,185	4,538	3,606
10 – 19	1,857	1,799	1,594	1,577	1,643	1,717	1,842	2,030	1,652
20 – 49	1,915	1,909	1,776	1,724	1,835	1,949	2,110	2,238	1,718
50 – 99	970	993	882	962	1,030	976	1,076	1,118	811
100 – 199	644	644	570	586	581	664	741	709	509
200 – 499	445	466	429	454	472	464	482	422	307
500 – 999	222	204	158	171	157	158	177	160	114
1,000 – 1,999	124	135	132	120	121	120	127	120	88
2,000 – 4,999	93	101	88	75	80	73	71	62	49
> 4,999	50	48	43	44	49	44	42	40	38
Total	11,132	10,771	9,805	9,650	9,785	9,968	10,853	11,437	8,892

1. Canada totals include the Territories

2. Employment size is based on total employment in Canada

Table 4 – Counts of industrial R&D performers by employment size – Atlantic Canada

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	209	241	277	240	232	205	192	174	107
10 – 19	66	72	72	73	71	80	71	52	39
20 – 49	63	71	74	72	83	67	72	59	42
50 – 99	33	45	37	51	50	39	37	35	19
100 – 199	24	20	25	20	25	36	40	26	17
200 – 499	19	26	21	30	30	26	19	20	16
500 – 999	22	15	9	12	18	24	38	36	24
1,000 – 1,999	11	9	11	10	11	10	16	15	13
2,000 – 4,999	15	17	12	6	12	15	15	15	12
> 4,999	1	2	2	2	5	3	3	4	8
Total	463	518	540	516	537	505	503	435	298

1. Employment size is based on total employment in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 5 – Counts of industrial R&D performers by employment size – Quebec

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	1,381	1,443	1,492	1,490	1,444	1,435	1,620	1,782	1,589
10 – 19	663	680	672	668	731	749	812	959	828
20 – 49	710	722	753	708	783	904	974	1,026	834
50 – 99	374	381	380	403	455	439	487	524	395
100 – 199	243	245	244	239	249	291	325	313	232
200 – 499	165	166	165	177	187	182	194	180	121
500 – 999	79	73	56	65	59	61	74	76	50
1,000 – 1,999	49	48	50	48	46	45	47	41	33
2,000 – 4,999	26	28	30	23	29	23	29	31	24
> 4,999	28	24	22	27	33	33	31	27	28
Total	3,718	3,810	3,864	3,848	4,016	4,162	4,593	4,957	4,136

1. Employment size is based on total employment in Canada

Table 6 – Counts of industrial R&D performers by employment size – Ontario

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	1,616	1,426	1,290	1,251	1,250	1,233	1,376	1,510	1,140
10 – 19	672	648	539	536	506	563	588	671	508
20 – 49	681	673	589	604	648	647	693	780	575
50 – 99	377	370	297	356	367	361	407	375	272
100 – 199	274	272	232	240	234	267	301	295	202
200 – 499	202	213	192	198	203	192	210	169	143
500 – 999	103	98	77	90	79	81	92	80	66
1,000 – 1,999	68	74	68	58	63	63	66	69	56
2,000 – 4,999	51	57	45	41	50	47	41	36	36
> 4,999	48	44	39	37	45	41	38	41	43
Total	4,092	3,875	3,368	3,411	3,445	3,495	3,812	4,026	3,041

1. Employment size is based on total employment in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 7 – Counts of industrial R&D performers by employment size – Manitoba & Saskatchewan

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	217	177	144	122	122	115	135	132	99
10 – 19	78	64	46	48	58	49	56	55	40
20 – 49	86	88	76	78	64	72	74	78	54
50 – 99	45	42	43	53	41	39	38	44	38
100 – 199	31	29	27	24	35	44	44	35	27
200 – 499	27	32	28	34	30	27	26	21	13
500 – 999	22	15	13	17	18	20	26	22	27
1,000 – 1,999	22	19	14	14	15	14	16	20	15
2,000 – 4,999	12	14	11	9	12	14	14	15	14
> 4,999	3	2	3	2	2	5	3	2	4
Total	543	482	405	401	397	399	432	424	331

¹ Employment size is based on total employment in Canada

Table 8 – Counts of industrial R&D performers by employment size – Alberta

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	535	467	415	365	335	379	391	420	289
10 – 19	133	132	102	100	122	113	125	120	93
20 – 49	140	130	115	115	109	110	125	106	84
50 – 99	57	68	56	60	57	39	50	64	34
100 – 199	42	40	36	41	44	40	39	37	31
200 – 499	27	38	29	31	35	31	33	26	21
500 – 999	19	14	22	15	17	19	20	19	12
1,000 – 1,999	19	22	14	14	16	20	12	12	13
2,000 – 4,999	14	17	15	9	12	10	11	11	13
> 4,999	7	6	7	5	5	5	5	6	7
Total	993	934	811	755	752	766	811	821	597

¹ Employment size is based on total employment in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 9 – Counts of industrial R&D performers by employment size – British Columbia

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	number of establishments								
0 – 9	843	716	532	486	438	442	477	526	390
10 – 19	248	203	161	151	152	161	189	173	149
20 – 49	235	231	171	155	154	154	175	192	135
50 – 99	95	98	81	82	86	77	86	91	68
100 – 199	62	59	44	42	32	46	51	50	39
200 – 499	38	41	37	35	35	36	30	29	23
500 – 999	20	11	7	9	13	14	18	16	13
1,000 – 1,999	13	16	13	10	10	13	14	11	12
2,000 – 4,999	10	12	9	11	10	11	12	12	8
> 4,999	9	7	10	7	10	10	7	7	7
Total	1,573	1,394	1,065	988	940	964	1,059	1,107	844

1. Employment size is based on total employment in Canada

Table 10 – Counts of industrial R&D performers by size of R&D expenditures – Canada¹

Size of R&D ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of enterprises								
0 – 24	2,787	2,603	2,446	2,387	2,131	2,031	1,984	1,969	1,459
25 – 49	1,818	1,728	1,690	1,599	1,699	1,659	1,694	1,794	1,394
50 – 99	1,956	1,893	1,753	1,765	1,814	1,808	2,038	2,171	1,651
100 – 199	1,766	1,670	1,454	1,483	1,565	1,625	1,885	1,975	1,534
200 – 399	1,195	1,190	1,015	964	1,044	1,163	1,272	1,376	999
400 – 999	853	871	630	639	708	791	974	1,024	779
1,000 – 1,999	331	364	357	338	327	367	405	446	413
2,000 – 9,999	322	342	343	354	374	394	452	497	471
> 9,999	104	110	117	121	123	130	149	185	192
Total	11,132	10,771	9,805	9,650	9,785	9,968	10,853	11,437	8,892

1. Canada totals include the Territories

2. Size of R&D is based on total R&D expenditures in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 11 – Counts of industrial R&D performers by size of R&D expenditures – Atlantic Canada									
Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	123	137	165	146	137	117	96	82	51
25 – 49	63	93	96	80	97	88	72	57	46
50 – 99	85	86	91	93	83	83	91	73	46
100 – 199	66	59	66	61	69	63	66	57	37
200 – 399	44	54	43	47	47	50	44	45	19
400 – 999	30	34	23	22	29	22	34	29	14
1,000 – 1,999	16	18	17	19	20	23	18	14	6
2,000 – 9,999	19	14	17	23	26	24	36	39	29
> 9,999	17	23	22	27	30	38	43	42	44
Total	463	518	540	516	537	505	503	435	298

1. Size of R&D is based on total R&D expenditures in Canada

Table 12 – Counts of industrial R&D performers by size of R&D expenditures – Quebec									
Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	947	940	901	1,029	1,011	946	920	947	755
25 – 49	676	648	721	705	749	757	806	889	755
50 – 99	654	698	706	764	761	792	923	1,031	854
100 – 199	591	595	589	550	592	648	780	822	684
200 – 399	353	402	410	327	351	429	463	527	409
400 – 999	252	268	262	215	265	281	344	344	284
1,000 – 1,999	100	109	118	102	104	119	132	137	131
2,000 – 9,999	89	97	101	99	122	124	148	170	170
> 9,999	56	53	56	57	61	66	77	90	94
Total	3,718	3,810	3,864	3,848	4,016	4,162	4,593	4,957	4,136

1. Size of R&D is based on total R&D expenditures in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 13 – Counts of industrial R&D performers by size of R&D expenditures – Ontario

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	846	762	694	652	503	518	505	518	342
25 – 49	575	545	511	473	504	464	493	494	355
50 – 99	689	653	593	567	607	578	628	669	491
100 – 199	674	593	497	572	585	616	679	720	514
200 – 399	484	459	363	387	447	456	515	557	397
400 – 999	377	391	251	289	319	361	434	447	338
1,000 – 1,999	156	173	157	162	159	170	197	220	203
2,000 – 9,999	209	212	214	217	220	219	239	256	255
> 9,999	82	87	88	92	101	113	122	145	146
Total	4,092	3,875	3,368	3,411	3,445	3,495	3,812	4,026	3,041

1. Size of R&D is based on total R&D expenditures in Canada

Table 14 – Counts of industrial R&D performers by size of R&D expenditures – Manitoba and Saskatchewan

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	145	128	134	101	90	90	85	76	60
25 – 49	81	74	50	67	62	63	52	64	42
50 – 99	81	66	49	46	64	59	81	61	40
100 – 199	63	56	47	62	52	48	59	59	46
200 – 399	54	47	31	23	31	38	38	41	21
400 – 999	36	26	14	19	15	17	23	30	25
1,000 – 1,999	18	24	21	22	16	13	15	16	15
2,000 – 9,999	42	36	33	35	40	38	39	39	38
> 9,999	17	20	24	25	23	33	35	36	40
Total	543	482	405	401	397	399	432	424	331

1. Size of R&D is based on total R&D expenditures in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Table 15 – Counts of industrial R&D performers by size of R&D expenditures – Alberta

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	286	261	239	190	179	168	160	148	111
25 – 49	156	153	127	128	117	131	124	141	70
50 – 99	166	138	123	128	124	126	143	129	95
100 – 199	133	142	119	103	120	103	132	146	105
200 – 399	102	90	74	75	87	96	98	86	62
400 – 999	63	59	33	40	40	51	64	68	45
1,000 – 1,999	29	35	36	28	24	28	19	30	29
2,000 – 9,999	39	32	32	38	35	35	43	39	41
> 9,999	19	24	28	25	26	28	28	34	39
Total	993	934	811	755	752	766	811	821	597

1. Size of R&D is based on total R&D expenditures in Canada

Table 16 – Counts of industrial R&D performers by size of R&D expenditures – British Columbia

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	number of establishments								
0 – 24	413	355	308	267	207	192	213	196	135
25 – 49	258	212	184	145	169	156	146	149	126
50 – 99	278	249	188	167	173	168	173	208	125
100 – 199	239	225	136	133	144	147	169	171	149
200 – 399	165	150	97	106	80	96	117	120	93
400 – 999	115	106	48	59	50	73	87	112	78
1,000 – 1,999	38	33	38	33	34	42	45	38	36
2,000 – 9,999	44	39	37	46	51	56	73	71	56
> 9,999	23	25	29	32	32	34	36	42	46
Total	1,573	1,394	1,065	988	940	964	1,059	1,107	844

1. Size of R&D is based on total R&D expenditures in Canada

❖ Companies with multi-establishments are included in each applicable region. Therefore regional components will not add to Canada total.

Business enterprise R&D activities (BERD), by region

Table 17 – BERD by data source – Canada and the regions

Region / Data source		1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
		in millions of \$								
Canada ¹	Survey	6,345.8	6,838.7	6,986.2	7,724.4	8,571.9	9,200.7	10,956.3	12,343.2	11,258.4
	CRA	1,221.4	1,151.8	1,009.7	1,016.4	1,111.6	1,200.4	1,390.2	1,503.7	1,124.2
	Total	7,567.2	7,990.5	7,996.0	8,740.8	9,683.5	10,401.2	12,346.5	13,847.0	12,382.6
Atlantic Canada	Survey	84.5	82.9	88.4	63.4	73.3	79.2	84.0	99.2	93.8
	CRA	40.8	48.3	44.4	44.6	49.1	44.0	49.6	44.8	24.3
	Total	125.2	131.2	132.8	108.0	122.4	123.1	133.6	144.0	118.0
Quebec	Survey	1,678.7	1,886.0	1,975.9	2,156.5	2,351.1	2,595.0	3,053.6	3,480.0	3,364.4
	CRA	377.5	390.6	417.6	362.2	412.9	451.8	532.3	581.4	463.8
	Total	2,056.2	2,276.6	2,393.4	2,518.7	2,764.0	3,046.8	3,585.8	4,061.4	3,828.3
Ontario	Survey	3,618.8	3,873.0	3,894.1	4,422.4	4,946.1	5,323.9	6,305.4	7,015.6	6,101.2
	CRA	492.8	446.8	361.8	410.4	448.1	474.9	549.1	592.0	426.7
	Total	4,111.6	4,319.8	4,255.9	4,832.8	5,394.2	5,798.9	6,854.5	7,607.7	6,527.9
Manitoba and Saskatchewan	Survey	125.8	130.1	123.9	139.7	142.7	190.3	169.8	222.3	202.3
	CRA	46.3	39.2	27.6	31.7	33.1	36.3	38.5	41.7	32.4
	Total	172.1	169.3	151.6	171.4	175.8	226.5	208.3	264.0	234.8
Alberta	Survey	409.1	401.3	457.2	475.8	539.9	406.0	495.0	605.1	624.1
	CRA	99.7	89.3	66.6	69.7	78.2	84.6	97.5	98.9	70.0
	Total	508.8	490.6	523.8	545.5	618.1	490.5	592.5	704.0	694.2
British Columbia	Survey	428.9	465.4	446.7	466.6	518.9	605.6	848.6	920.7	872.2
	CRA	161.7	136.8	91.4	97.2	89.5	108.1	122.7	144.4	106.9
	Total	590.5	602.3	538.1	563.9	608.3	713.7	971.3	1,065.1	979.1

¹ Canada totals include the Territories

Table 18 – BERD by country of control – Canada and the regions

Region / Country of control		1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
		in millions of \$								
Canada ¹	Canada	5,319.9	5,613.2	5,452.4	5,712.4	6,467.9	7,071.9	8,723.7	9,743.4	8,211.8
	Foreign	2,247.3	2,377.3	2,543.6	3,028.4	3,215.7	3,329.3	3,622.7	4,103.6	4,170.8
	Total	7,567.2	7,990.5	7,996.0	8,740.8	9,683.5	10,401.2	12,346.5	13,847.0	12,382.6
Atlantic Canada	Canada	112.1	116.8	118.7	89.3	95.4	97.7	99.3	92.7	74.1
	Foreign	13.2	14.4	14.1	18.8	27.0	25.5	34.3	51.3	43.9
	Total	125.2	131.2	132.8	108.0	122.4	123.1	133.6	144.0	118.0
Quebec	Canada	1,465.7	1,599.5	1,538.1	1,524.1	1,730.1	2,006.2	2,343.2	2,668.5	2,381.9
	Foreign	590.5	677.1	855.4	994.7	1,033.9	1,040.6	1,242.6	1,392.9	1,446.4
	Total	2,056.2	2,276.6	2,393.4	2,518.7	2,764.0	3,046.8	3,585.8	4,061.4	3,828.3
Ontario	Canada	2,755.5	3,007.2	2,919.7	3,187.9	3,588.5	3,809.6	4,842.2	5,413.7	4,345.1
	Foreign	1,356.1	1,312.6	1,336.2	1,644.8	1,805.6	1,989.3	2,012.3	2,194.0	2,182.8
	Total	4,111.6	4,319.8	4,255.9	4,832.8	5,394.2	5,798.9	6,854.5	7,607.7	6,527.9
Manitoba and Saskatchewan	Canada	132.4	128.0	123.6	125.5	134.5	178.3	161.0	202.5	174.7
	Foreign	39.7	41.3	28.0	45.9	41.3	48.3	47.3	61.5	60.1
	Total	172.1	169.3	151.6	171.4	175.8	226.5	208.3	264.0	234.8
Alberta	Canada	411.7	401.5	402.9	364.1	445.8	374.6	458.4	522.8	469.0
	Foreign	97.1	89.1	120.9	181.4	172.2	115.9	134.1	181.2	225.2
	Total	508.8	490.6	523.8	545.5	618.1	490.5	592.5	704.0	694.2
British Columbia	Canada	439.8	359.4	349.0	420.9	472.7	604.7	819.3	842.7	767.0
	Foreign	150.7	242.8	189.0	142.9	135.6	108.9	152.0	222.4	212.1
	Total	590.5	602.3	538.1	563.9	608.3	713.7	971.3	1,065.1	979.1

1. Canada totals include the Territories

Table 19 – BERD by employment size – Canada¹

Employment size ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	in millions of \$								
0 – 9	485.9	449.8	431.4	391.2	402.6	411.1	476.5	536.7	446.6
10 – 19	362.0	346.8	272.7	265.8	270.3	310.9	331.0	394.6	328.4
20 – 49	541.2	545.6	508.8	522.3	589.3	631.8	774.8	907.8	845.7
50 – 99	474.9	494.4	473.3	493.4	599.9	587.2	772.0	1,074.5	1,042.0
100 – 199	517.1	606.9	617.1	677.6	688.4	780.6	1,100.1	1,287.3	1,109.1
200 – 499	561.8	679.1	760.7	882.0	885.2	1,081.9	1,017.8	1,154.7	1,200.9
500 – 999	673.6	754.6	783.3	838.9	921.7	775.2	1,136.5	1,298.8	1,164.8
1,000 – 1,999	780.1	865.0	914.3	905.2	1,085.9	1,467.9	1,486.7	1,602.5	1,815.3
2,000 – 4,999	723.6	704.5	599.8	668.0	802.2	879.0	1,101.3	1,117.3	1,150.7
> 4,999	2,447.1	2,543.8	2,634.7	3,096.4	3,438.1	3,475.5	4,149.9	4,472.8	3,279.1
Total	7,567.2	7,990.5	7,996.0	8,740.8	9,683.5	10,401.2	12,346.5	13,847.0	12,382.6

1. Canada totals include the Territories

2. Employment size is based on total Canadian employment

Table 20 – BERD by employment size – Atlantic Canada

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	in millions of \$								
0 – 9	17.0	15.5	18.0	13.0	13.9	13.0	13.4	12.2	6.8
10 – 19	12.2	13.0	10.1	9.7	8.0	11.2	12.0	8.6	4.3
20 – 49	23.1	21.5	22.3	31.4	30.7	28.2	34.2	30.3	28.1
50 – 99	10.6	15.1	13.9	14.0	18.8	11.7	14.5	19.0	12.4
100 – 199	5.0	7.9	8.0	12.8	11.2	18.2	17.6	15.0	13.3
200 – 499	8.8	7.3	3.4	5.3	7.2	12.1	7.9	14.5	13.6
500 – 999	4.2	2.7	8.8	7.2	12.0	4.2	10.7	17.1	11.3
> 999	44.4	48.1	48.4	14.5	20.7	24.6	23.2	27.5	28.4
Total	125.2	131.2	132.8	108.0	122.4	123.1	133.6	144.0	118.0

1. Employment size is based on total Canadian employment

Table 21 – BERD by employment size – Quebec

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	in millions of \$								
0 – 9	161.9	165.2	177.5	156.1	175.1	165.8	199.9	223.7	211.4
10 – 19	103.6	108.6	110.5	97.2	111.0	110.9	115.8	147.7	123.4
20 – 49	137.5	160.1	173.0	165.1	209.4	235.3	265.9	320.4	304.0
50 – 99	111.0	126.0	129.3	121.4	155.9	141.8	210.2	292.6	307.4
100 – 199	150.2	177.5	166.2	163.5	215.7	205.8	446.5	347.2	294.9
200 – 499	192.7	172.4	195.0	223.2	211.5	279.4	315.8	324.0	328.6
500 – 999	212.7	293.2	298.3	277.6	309.0	262.0	377.0	487.4	367.3
1,000-1,999	233.9	235.8	315.5	382.8	430.0	630.9	477.4	511.5	721.5
2,000-4,999	226.1	208.6	176.6	148.8	152.4	150.4	336.9	477.4	297.4
> 4,999	526.6	629.1	651.5	783.1	793.9	864.4	840.6	929.5	872.4
Total	2,056.2	2,276.6	2,393.4	2,518.7	2,764.0	3,046.8	3,585.8	4,061.4	3,828.3

1. Employment size is based on total Canadian employment

Table 22 – BERD by employment size – Ontario

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	in millions of \$								
0 – 9	139.6	121.9	112.1	108.1	109.7	112.6	129.6	151.8	116.0
10 – 19	156.1	154.2	106.0	109.4	103.0	122.6	123.8	151.0	126.0
20 – 49	237.4	237.8	208.9	211.6	241.3	239.3	298.1	386.8	359.1
50 – 99	219.0	221.7	182.8	230.7	292.7	307.0	402.8	535.8	471.9
100 – 199	287.4	312.1	339.1	358.4	333.9	403.4	474.3	716.2	576.2
200 – 499	292.6	367.2	410.0	442.3	451.1	507.8	521.2	560.5	618.3
500 – 999	266.8	336.5	370.8	396.8	433.9	431.7	513.5	477.6	570.0
1,000 – 1,999	434.7	481.7	486.1	459.9	536.6	659.8	696.0	797.2	824.7
2,000 – 4,999	323.7	331.5	224.7	391.8	472.6	593.2	563.1	465.9	612.3
> 4,999	1,754.3	1,755.2	1,815.4	2,123.9	2,419.5	2,421.5	3,132.0	3,364.8	2,253.5
Total	4,111.6	4,319.8	4,255.9	4,832.8	5,394.2	5,798.9	6,854.5	7,607.7	6,527.9

1. Employment size is based on total Canadian employment

Table 23 – BERD by employment size – Manitoba and Saskatchewan

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
person-years	in millions of \$								
0 – 9	24.2	20.5	19.9	17.3	20.1	22.4	26.2	27.5	22.2
10 – 19	11.3	9.4	6.0	4.9	5.2	7.0	11.1	14.7	12.9
20 – 49	22.1	24.1	19.3	18.8	9.0	11.0	12.8	16.1	17.6
50 – 99	23.4	25.9	34.1	27.0	31.1	17.8	14.4	15.8	24.3
100 – 199	16.6	16.4	16.7	30.7	40.9	30.2	31.7	23.5	13.0
200 – 499	28.3	19.0	17.2	16.5	15.1	39.3	25.3	84.4	32.7
500 – 999	15.4	17.8	10.3	29.1	19.4	31.0	33.1	30.5	34.7
1,000 – 1,999	20.3	25.4	17.1	17.4	14.3	9.2	25.6	36.6	25.9
> 1,999	10.6	10.9	10.9	9.8	20.7	58.5	28.1	14.9	51.5
Total	172.1	169.3	151.6	171.4	175.8	226.5	208.3	264.0	234.8

1. Employment size is based on total Canadian employment

Table 24 – BERD by employment size – Alberta

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
person-years	in millions of \$								
0 – 9	51.6	47.9	42.9	39.3	31.5	40.5	44.6	49.8	32.3
10 – 19	32.2	26.6	17.7	17.9	21.0	24.8	24.1	26.1	22.3
20 – 49	41.0	34.0	31.0	33.3	37.6	37.1	47.7	43.1	46.7
50 – 99	29.0	32.4	29.8	31.5	23.3	19.3	23.5	45.6	43.5
100 – 199	26.8	30.9	51.4	44.2	50.8	55.0	59.4	74.6	86.1
200 – 499	12.6	16.6	21.4	53.7	48.0	51.4	45.8	48.8	60.2
500 – 999	25.7	15.7	29.0	73.9	66.6	33.0	51.4	77.3	38.3
1,000 – 1,999	60.7	81.8	57.5	34.5	40.0	31.4	15.2	86.5	88.7
> 1,999	229.3	204.7	243.0	217.2	299.3	197.9	280.8	252.3	276.1
Total	508.8	490.6	523.8	545.5	618.1	490.5	592.5	704.0	694.2

1. Employment size is based on total Canadian employment

Table 25 – BERD by employment size – British Columbia

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person-years	in millions of \$								
0 – 9	91.0	78.4	60.8	57.1	51.9	56.3	62.7	71.7	58.0
10 – 19	45.2	34.8	22.3	26.7	21.7	34.0	43.9	46.2	39.5
20 – 49	79.5	68.0	54.2	62.2	61.3	80.8	116.1	111.1	90.1
50 – 99	81.8	73.2	83.4	68.7	78.1	89.6	106.5	165.6	182.5
100 – 199	31.1	62.2	35.6	68.1	35.8	67.9	70.5	110.9	125.6
200 – 499	26.6	96.5	113.7	141.0	152.3	191.9	102.0	122.5	147.6
500 – 999	148.9	88.7	66.0	54.0	80.9	13.3	150.7	208.8	143.3
1,000 – 1,999	25.3	34.9	31.1	6.2	59.0	126.5	262.8	156.0	146.0
2,000 – 4,999	23.7	25.5	15.9	36.1	34.1	29.6	25.5	42.9	31.7
> 4,999	37.4	40.1	55.1	43.7	33.2	23.7	30.6	29.4	14.6
Total	590.5	602.3	538.1	563.9	608.3	713.7	971.3	1,065.1	979.1

1. Employment size is based on total Canadian employment

Table 26 – BERD by size of R&D expenditures – Canada¹

Size of R&D ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	33.4	31.7	29.6	29.1	26.7	25.2	25.4	25.3	19.2
25 – 49	64.9	61.8	60.8	57.7	61.2	60.0	61.1	65.3	50.6
50 – 99	139.3	135.9	124.7	125.8	129.8	129.5	146.6	155.9	119.5
100 – 199	248.0	236.1	203.7	208.9	220.8	230.9	267.1	280.6	218.5
200 – 399	333.6	333.6	286.0	271.0	291.3	325.7	357.7	388.4	282.4
400 – 999	527.6	543.3	392.6	391.7	429.7	478.6	599.7	634.6	478.4
1,000 – 1,999	448.5	503.2	505.2	481.7	465.0	516.3	565.7	624.3	576.5
2,000 – 9,999	1,314.6	1,370.5	1,342.6	1,436.5	1,599.6	1,686.3	1,881.0	2,104.3	2,034.9
> 9,999	4,457.3	4,774.6	5,050.7	5,738.5	6,459.5	6,948.7	8,442.2	9,568.2	8,602.7
Total	7,567.2	7,990.5	7,996.0	8,740.8	9,683.5	10,401.2	12,346.5	13,847.0	12,382.6

1. Canada totals include the Territories

2. Size of R&D program is based on Canada total R&D

Table 27 – BERD by size of R&D expenditures – Atlantic Canada

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	1.4	1.5	2.1	1.8	1.6	1.4	1.2	0.9	0.7
25 – 49	2.2	3.3	3.4	2.9	3.4	3.0	2.6	2.0	1.6
50 – 99	6.1	6.1	6.4	6.8	5.7	5.6	6.5	5.2	3.3
100 – 199	9.2	8.4	9.5	8.0	9.6	8.9	9.5	8.0	5.6
200 – 399	11.8	15.3	11.6	13.2	12.5	13.7	11.5	12.4	5.4
400 – 999	19.7	19.8	15.1	14.8	18.5	14.2	20.4	18.3	9.1
1,000 – 1,999	19.0	23.0	21.7	20.9	23.0	22.9	21.4	14.1	10.2
2,000 – 9,999	36.0	34.7	22.6	32.8	33.6	38.5	37.1	64.8	49.7
> 9,999	22.1	21.4	40.4	7.0	14.6	15.9	24.4	19.0	32.5
Total	125.2	131.2	132.8	108.0	122.4	123.1	133.6	144.0	118.0

1. Size of R&D program is based on Canada total R&D

Table 28 – BERD by size of R&D expenditures – Quebec

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	11.7	11.9	11.3	12.9	13.1	11.9	12.1	12.6	10.0
25 – 49	24.2	22.9	25.9	25.2	26.8	27.2	28.8	32.2	27.3
50 – 99	46.5	49.9	50.5	54.1	54.1	56.1	66.5	73.5	61.8
100 – 199	82.8	83.1	81.9	77.3	83.4	90.8	108.8	115.9	96.5
200 – 399	97.2	111.8	115.2	91.2	98.8	121.0	128.6	148.6	114.5
400 – 999	155.2	164.4	162.7	129.0	155.7	161.5	210.4	212.2	170.8
1,000 – 1,999	122.3	137.9	156.1	140.7	143.7	162.8	173.2	193.3	180.3
2,000 – 9,999	267.3	310.4	297.0	302.9	378.6	419.5	486.3	604.0	599.2
> 9,999	1,248.9	1,384.2	1,492.9	1,685.3	1,809.7	1,996.1	2,371.1	2,669.2	2,567.9
Total	2,056.2	2,276.6	2,393.4	2,518.7	2,764.0	3,046.8	3,585.8	4,061.4	3,828.3

1. Size of R&D program is based on Canada total R&D

Table 29 – BERD by size of R&D expenditures – Ontario

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	10.0	9.3	8.2	8.1	6.4	6.6	6.7	6.7	4.6
25 – 49	20.5	19.8	18.5	17.2	18.5	17.1	18.1	18.5	13.0
50 – 99	49.2	47.1	42.4	41.0	44.2	42.2	44.9	48.2	36.0
100 – 199	94.7	84.7	69.2	81.1	82.7	88.0	97.2	103.5	72.9
200 – 399	135.6	127.6	102.7	110.4	124.1	126.8	145.4	157.6	111.4
400 – 999	229.1	247.8	155.4	179.0	193.1	218.5	268.0	278.6	208.9
1,000 – 1,999	203.0	223.1	210.6	217.3	207.1	226.0	270.6	305.1	275.4
2,000 – 9,999	740.5	770.1	753.3	778.7	839.0	821.3	890.9	983.0	991.4
> 9,999	2,629.0	2,790.5	2,895.8	3,399.9	3,879.2	4,252.4	5,112.7	5,706.6	4,814.1
Total	4,111.6	4,319.8	4,255.9	4,832.8	5,394.2	5,798.9	6,854.5	7,607.7	6,527.9

1. Size of R&D program is based on Canada total R&D

Table 30 – BERD by size of R&D expenditures – Manitoba and Saskatchewan

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	1.8	1.6	1.7	1.2	1.1	1.2	1.1	1.0	0.9
25 – 49	2.9	2.6	1.8	2.4	2.2	2.2	1.8	2.3	1.5
50 – 99	5.7	4.7	3.5	3.3	4.5	4.2	5.8	4.5	2.9
100 – 199	8.5	7.9	6.5	8.8	7.3	7.0	8.4	8.5	6.6
200 – 399	14.8	12.8	9.0	6.7	8.7	10.2	10.2	11.7	6.2
400 – 999	22.3	16.2	10.2	10.8	7.4	10.1	14.1	17.5	15.4
1,000 – 1,999	22.1	30.8	26.3	26.4	19.3	14.9	17.8	21.2	22.2
2,000 – 9,999	65.7	64.3	63.8	62.9	91.1	101.9	90.5	94.1	89.4
> 9,999	28.3	28.3	28.8	48.9	34.2	74.8	58.6	103.1	89.8
Total	172.1	169.3	151.6	171.4	175.8	226.5	208.3	264.0	234.8

1. Size of R&D program is based on Canada total R&D

Table 31 – BERD by size of R&D expenditures – Alberta

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	3.3	3.0	2.9	2.0	2.1	1.9	1.8	1.7	1.3
25 – 49	5.6	5.6	4.4	4.7	4.1	4.7	4.5	5.0	2.5
50 – 99	11.6	9.9	8.6	9.0	8.8	9.1	10.1	9.5	6.6
100 – 199	19.4	20.1	17.5	14.3	16.9	15.0	19.2	20.2	15.2
200 – 399	28.7	25.5	20.0	20.3	24.0	26.7	28.0	24.2	18.3
400 – 999	38.4	35.0	19.9	22.9	25.9	31.4	38.7	41.3	28.1
1,000 – 1,999	33.1	44.5	43.2	31.3	29.0	35.0	24.1	38.8	38.7
2,000 – 9,999	100.7	78.6	96.3	120.5	124.7	121.1	131.5	120.8	118.6
> 9,999	268.0	268.4	311.0	320.5	382.6	245.6	334.6	442.5	464.9
Total	508.8	490.6	523.8	545.5	618.1	490.5	592.5	704.0	694.2

1. Size of R&D program is based on Canada total R&D

Table 32 – BERD by size of R&D expenditures – British Columbia

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	in millions of \$								
0 – 24	4.9	4.2	3.5	3.1	2.5	2.2	2.5	2.4	1.8
25 – 49	9.2	7.5	6.7	5.2	6.2	5.7	5.3	5.2	4.5
50 – 99	19.8	17.8	13.1	11.6	12.3	12.2	12.8	15.0	8.9
100 – 199	33.1	31.5	19.1	19.1	20.6	21.3	24.0	24.3	21.8
200 – 399	44.6	41.4	27.6	29.1	22.9	27.1	33.7	33.7	26.6
400 – 999	64.7	61.6	29.3	35.2	29.1	43.5	48.9	67.6	46.2
1,000 – 1,999	48.9	43.9	47.3	45.0	42.9	54.8	58.6	51.8	49.7
2,000 – 9,999	104.4	112.5	109.7	138.7	132.5	183.9	244.7	237.6	186.6
> 9,999	261.0	281.8	281.7	276.8	339.2	363.0	540.8	627.5	633.0
Total	590.5	602.3	538.1	563.9	608.3	713.7	971.3	1,065.1	979.1

1. Size of R&D program is based on Canada total R&D

Table 33 – BERD concentration – Canada

Enterprises	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	1,651.4	21.8	1,912.0	23.9	2,055.7	25.7	2,457.8	28.1	2,878.9	29.7
Top 10	2,110.8	27.9	2,359.5	29.5	2,512.9	31.4	2,950.4	33.8	3,480.8	35.9
Top 25	2,966.3	39.2	3,123.9	39.1	3,279.9	41.0	3,845.5	44.0	4,415.3	45.6
Top 50	3,673.8	48.5	3,854.0	48.2	4,012.2	50.2	4,658.9	53.3	5,281.6	54.5
Top 75	4,106.6	54.3	4,331.0	54.2	4,513.7	56.4	5,156.0	59.0	5,801.6	59.9
Top 100	4,416.2	58.4	4,668.3	58.4	4,863.8	60.8	5,511.1	63.0	6,180.9	63.8
Total	7,567.2	100.0	7,990.5	100.0	7,996.0	100.0	8,740.8	100.0	9,683.5	100.0

Table 33 (continued) – BERD concentration – Canada

Enterprises	1999		2000		2001		2002 ^b	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	2,887.7	27.8	3,778.4	30.6	3,794.0	27.4	2,567.6	20.7
Top 10	3,544.4	34.1	4,513.4	36.6	4,503.4	32.5	3,223.1	26.0
Top 25	4,620.3	44.4	5,661.9	45.9	5,772.4	41.7	4,567.3	36.9
Top 50	5,566.8	53.5	6,679.4	54.1	6,944.5	50.2	5,885.9	47.5
Top 75	6,157.3	59.2	7,342.9	59.5	7,756.2	56.0	6,714.1	54.2
Top 100	6,584.0	63.3	7,820.0	63.3	8,352.5	60.3	7,299.2	58.9
Total	10,401.2	100.0	12,346.5	100.0	13,847.0	100.0	12,382.6	100.0

Table 34 – BERD concentration – Atlantic Canada

Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	36.5	29.2	38.3	29.2	46.2	34.8	26.5	24.5	27.8	22.7
Top 10	52.8	42.1	50.9	38.8	58.7	44.2	37.0	34.2	41.0	33.5
Top 25	72.9	58.2	72.1	55.0	81.3	61.2	55.7	51.5	62.5	51.1
Top 50	90.8	72.5	89.8	68.5	97.7	73.6	72.6	67.2	81.2	66.3
Top 75	99.2	79.2	99.6	75.9	105.6	79.5	80.7	74.7	91.3	74.6
Top 100	105.1	83.9	106.9	81.5	111.3	83.8	87.0	80.5	97.9	80.0
Total	125.2	100.0	131.2	100.0	132.8	100.0	108.0	100.0	122.4	100.0

Table 34 (continued) – BERD concentration – Atlantic Canada

Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	29.9	24.3	25.9	19.4	30.8	21.4	31.2	26.4
Top 10	41.6	33.8	39.0	29.2	46.2	32.0	47.1	39.9
Top 25	64.3	52.3	63.4	47.5	76.4	53.0	77.5	65.7
Top 50	84.3	68.4	86.6	64.8	102.7	71.3	99.2	84.0
Top 75	93.8	76.2	98.9	74.0	114.6	79.6	106.3	90.1
Top 100	100.6	81.7	106.8	79.9	122.3	84.9	110.5	93.6
Total	123.1	100.0	133.6	100.0	144.0	100.0	118.0	100.0

Table 35 – BERD concentration – Quebec

Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	545.1	26.5	637.9	28.0	647.1	27.0	768.2	30.5	790.3	28.6
Top 10	770.3	37.5	900.8	39.6	930.2	38.9	1,092.9	43.4	1,160.6	42.0
Top 25	1,098.8	53.5	1,255.0	55.1	1,312.1	54.8	1,483.5	58.9	1,587.9	57.4
Top 50	1,314.6	64.0	1,461.6	64.2	1,552.3	64.9	1,737.2	69.0	1,849.3	66.9
Top 75	1,410.2	68.6	1,565.9	68.8	1,653.8	69.1	1,847.2	73.3	1,974.9	71.4
Top 100	1,476.8	71.9	1,633.2	71.7	1,723.3	72.0	1,920.8	76.3	2,063.6	74.7
Total	2,056.2	100.0	2,276.6	100.0	2,393.4	100.0	2,518.7	100.0	2,764.0	100.0

Table 35 (continued) – BERD concentration – Quebec

Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	893.2	29.3	1,011.3	28.2	1,025.5	25.3	964.8	25.2
Top 10	1,306.0	42.9	1,484.7	41.4	1,434.4	35.3	1,345.0	35.1
Top 25	1,732.9	56.9	1,948.2	54.3	2,019.7	49.7	1,899.0	49.6
Top 50	2,030.0	66.6	2,325.7	64.9	2,514.3	61.9	2,376.1	62.1
Top 75	2,168.9	71.2	2,496.2	69.6	2,743.8	67.6	2,629.3	68.7
Top 100	2,263.0	74.3	2,609.2	72.8	2,893.2	71.2	2,794.6	73.0
Total	3,046.8	100.0	3,585.8	100.0	4,061.4	100.0	3,828.3	100.0

Table 36 – BERD concentration – Ontario										
Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	1,354.8	33.0	1,500.5	34.7	1,611.7	37.9	1,892.9	39.2	2,317.4	43.0
Top 10	1,657.7	40.3	1,774.2	41.1	1,880.1	44.2	2,215.2	45.8	2,654.7	49.2
Top 25	2,125.8	51.7	2,213.7	51.2	2,323.5	54.6	2,727.7	56.4	3,146.6	58.3
Top 50	2,524.5	61.4	2,636.2	61.0	2,738.0	64.3	3,176.4	65.7	3,594.1	66.6
Top 75	2,744.6	66.8	2,873.8	66.5	2,972.2	69.8	3,437.8	71.1	3,873.3	71.8
Top 100	2,903.6	70.6	3,036.3	70.3	3,132.4	73.6	3,611.9	74.7	4,056.7	75.2
Total	4,111.6	100.0	4,319.8	100.0	4,255.9	100.0	4,832.8	100.0	5,394.2	100.0

Table 36 (continued) – BERD concentration – Ontario								
Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	2,265.0	39.1	3,013.1	44.0	3,004.5	39.5	1,915.5	29.3
Top 10	2,668.8	46.0	3,376.2	49.3	3,483.5	45.8	2,418.8	37.1
Top 25	3,275.2	56.5	4,022.1	58.7	4,180.6	55.0	3,276.2	50.2
Top 50	3,806.6	65.6	4,582.1	66.8	4,849.4	63.7	3,952.9	60.6
Top 75	4,149.1	71.5	4,941.4	72.1	5,304.0	69.7	4,393.3	67.3
Top 100	4,369.8	75.4	5,185.5	75.7	5,607.4	73.7	4,699.1	72.0
Total	5,798.9	100.0	6,854.5	100.0	7,607.7	100.0	6,527.9	100.0

Table 37 – BERD concentration – Manitoba and Saskatchewan

Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	35.1	20.4	35.3	20.9	38.3	25.3	52.6	30.7	47.8	27.2
Top 10	56.7	32.9	55.7	32.9	57.3	37.8	75.7	44.2	74.3	42.3
Top 25	90.9	52.8	90.5	53.4	90.4	59.6	111.1	64.9	118.3	67.3
Top 50	117.9	68.5	121.3	71.6	118.8	78.4	139.1	81.1	145.8	82.9
Top 75	133.2	77.4	136.4	80.6	130.6	86.2	150.3	87.7	155.7	88.6
Top 100	142.3	82.7	145.0	85.6	137.4	90.7	156.2	91.2	161.3	91.7
Total	172.1	100.0	169.3	100.0	151.6	100.0	171.4	100.0	175.8	100.0

Table 37 (continued) – BERD concentration – Manitoba and Saskatchewan

Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	72.3	31.9	48.1	23.1	91.1	34.5	61.8	26.3
Top 10	103.6	45.7	77.0	37.0	121.0	45.8	95.1	40.5
Top 25	157.6	69.6	131.0	62.9	173.1	65.6	152.8	65.1
Top 50	189.6	83.7	164.8	79.1	209.3	79.3	192.6	82.0
Top 75	202.4	89.3	178.8	85.9	227.7	86.2	211.3	90.0
Top 100	209.3	92.4	186.4	89.5	238.3	90.3	220.5	93.9
Total	226.5	100.0	208.3	100.0	264.0	100.0	234.8	100.0

Table 38 – BERD concentration – Alberta

Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	186.1	36.6	174.4	35.6	165.6	31.6	216.7	39.7	261.4	42.3
Top 10	255.7	50.2	246.9	50.3	254.4	48.6	282.3	51.8	343.9	55.6
Top 25	332.6	65.4	318.1	64.9	351.2	67.0	370.8	68.0	446.1	72.2
Top 50	379.1	74.5	362.7	73.9	412.1	78.7	437.5	80.2	510.3	82.6
Top 75	404.5	79.5	390.4	79.6	443.6	84.7	468.2	85.8	538.2	87.1
Top 100	421.7	82.9	408.5	83.3	461.7	88.1	484.7	88.8	554.5	89.7
Total	508.8	100.0	490.6	100.0	523.8	100.0	545.5	100.0	618.1	100.0

Table 38 (continued) – BERD concentration – Alberta

Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	192.1	39.2	254.4	42.9	264.4	37.6	250.5	36.1
Top 10	232.0	47.3	301.7	50.9	345.3	49.0	351.4	50.6
Top 25	307.3	62.6	385.0	65.0	466.1	66.2	481.8	69.4
Top 50	367.5	74.9	450.6	76.1	542.6	77.1	560.9	80.8
Top 75	398.0	81.1	485.9	82.0	581.1	82.5	599.9	86.4
Top 100	416.5	84.9	505.3	85.3	605.8	86.1	624.6	90.0
Total	490.5	100.0	592.5	100.0	704.0	100.0	694.2	100.0

Table 39 – BERD concentration – British Columbia

Establishments	1994		1995		1996		1997		1998	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	174.9	29.6	181.6	30.1	149.3	27.8	143.7	25.5	199.3	32.8
Top 10	227.4	38.5	247.1	41.0	228.4	42.5	219.0	38.8	266.6	43.8
Top 25	312.9	53.0	339.0	56.3	329.4	61.2	323.1	57.3	367.2	60.4
Top 50	368.6	62.4	396.0	65.8	389.5	72.4	392.2	69.6	444.1	73.0
Top 75	401.0	67.9	430.7	71.5	425.7	79.1	436.4	77.4	486.6	80.0
Top 100	423.0	71.6	452.1	75.1	447.8	83.2	462.9	82.1	513.5	84.4
Total	590.5	100.0	602.3	100.0	538.1	100.0	563.9	100.0	608.3	100.0

Table 39 (continued) – BERD concentration – British Columbia

Establishments	1999		2000		2001		2002 ^p	
	in millions of \$	%	in millions of \$	%	in millions of \$	%	in millions of \$	%
Top 5	239.9	33.6	355.2	36.6	306.8	28.8	273.6	27.9
Top 10	305.6	42.8	451.9	46.5	427.6	40.1	385.0	39.3
Top 25	413.1	57.9	586.2	60.4	625.4	58.7	594.6	60.7
Top 50	500.1	70.1	694.1	71.5	749.5	70.4	731.5	74.7
Top 75	550.1	77.1	760.9	78.3	818.2	76.8	798.7	81.6
Top 100	583.7	81.8	803.1	82.7	867.0	81.4	839.5	85.7
Total	713.7	100.0	971.3	100.0	1,065.1	100.0	979.1	100.0

Table 40 – BERD by major NAICS¹ industry – Canada²

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
	in millions of \$								
Agriculture, forestry, fishing and hunting	55.9	58.1	62.9	60.5	52.5	69.5	76.8	89.1	90.4
Mining and oil and gas extraction	191.8	201.6	197.1	189.3	153.7	134.1	182.2	213.3	193.0
Utilities	224.4	206.4	233.6	185.4	217.6	196.3	187.2	160.8	159.5
Construction	27.2	24.3	23.5	37.3	25.6	35.1	44.7	48.5	33.3
Manufacturing	4,528.5	4,976.5	5,116.7	5,789.9	6,506.4	7,078.6	8,459.8	8,974.4	7,648.2
Services	2,539.3	2,523.7	2,362.3	2,478.4	2,727.8	2,887.5	3,395.9	4,360.9	4,258.3
Total	7,567.2	7,990.5	7,996.0	8,740.8	9,683.5	10,401.2	12,346.5	13,847.0	12,382.6

1. North American Industry Classification System

2. Canada totals include the Territories

Table 41 – BERD by major NAICS¹ industry – Atlantic Canada

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
	in millions of \$								
Agriculture, forestry, fishing and hunting	5.1	5.0	5.1	3.2	2.2	2.0	3.1	1.9	0.9
Mining and oil and gas extraction	X	2.2	X	X	1.4	X	X	X	1.9
Utilities	X	X	X	X	X	0.7	3.9	3.8	X
Construction	0.7	X	X	X	X	X	X	X	X
Manufacturing	52.7	56.7	57.0	56.6	71.5	70.1	62.0	73.9	57.4
Services	62.5	66.5	65.3	47.3	46.4	48.3	60.7	61.0	52.4
Total	125.2	131.2	132.8	108.0	122.4	123.1	133.6	144.0	118.0

1. North American Industry Classification System

Table 42 – BERD by major NAICS¹ industry – Quebec

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in millions of \$									
Agriculture, forestry, fishing and hunting	8.8	10.6	12.8	12.1	12.6	16.7	22.7	26.6	33.6
Mining and oil and gas extraction	16.6	19.2	10.8	X	2.8	X	2.3	X	X
Utilities	137.7	142.2	115.7	101.6	135.0	114.2	103.3	107.7	105.5
Construction	9.5	9.1	9.9	X	11.4	X	19.7	X	X
Manufacturing	1,200.2	1,371.3	1,434.1	1,551.0	1,639.7	1,810.6	2,080.3	2,366.3	2,249.0
Services	682.5	724.2	810.2	825.1	962.5	1,086.3	1,357.6	1,536.3	1,423.4
Total	2,056.2	2,276.6	2,393.4	2,518.7	2,764.0	3,046.8	3,585.8	4,061.4	3,828.3

1. North American Industry Classification System

Table 43 – BERD by major NAICS¹ industry – Ontario

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in millions of \$									
Agriculture, forestry, fishing and hunting	22.4	20.3	26.4	20.8	19.0	23.2	18.0	22.6	23.0
Mining and oil and gas extraction	18.4	21.6	18.1	30.0	29.1	24.6	26.6	19.9	11.3
Utilities	79.7	56.9	109.5	76.4	75.2	74.2	68.2	41.6	35.4
Construction	9.8	8.9	8.0	9.3	6.2	8.8	11.1	19.4	12.0
Manufacturing	2,801.6	3,041.3	3,085.4	3,581.2	4,097.8	4,452.6	5,370.3	5,503.2	4,537.5
Services	1,179.7	1,170.8	1,008.6	1,115.1	1,166.9	1,215.2	1,360.2	2,001.0	1,908.7
Total	4,111.6	4,319.8	4,255.9	4,832.8	5,394.2	5,798.9	6,854.5	7,607.7	6,627.9

1. North American Industry Classification System

Table 44 – BERD by major NAICS¹ industry – Manitoba and Saskatchewan

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in millions of \$									
Agriculture, forestry, fishing and hunting	2.8	6.2	4.3	6.9	3.6	3.1	5.6	7.8	8.8
Mining and oil and gas extraction	X	5.2	3.4	21.9	6.7	9.5	6.0	12.3	26.3
Utilities	X	X	X	X	X	X	X	X	X
Construction	X	X	X	X	X	X	X	X	X
Manufacturing	78.8	88.1	70.0	61.1	76.5	117.7	108.5	159.2	107.1
Services	83.9	67.3	72.0	79.8	87.3	94.3	80.5	82.6	81.7
Total	172.1	169.3	151.6	171.4	175.8	226.5	208.3	264.0	234.8

1. North American Industry Classification System

Table 45 – BERD by major NAICS¹ industry – Alberta

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^B
	in millions of \$								
Agriculture, forestry, fishing and hunting	3.9	4.5	3.7	2.4	4.0	9.4	7.6	6.6	6.8
Mining and oil and gas extraction	137.6	137.8	155.0	117.8	101.4	84.3	128.5	160.1	135.6
Utilities	2.2	1.2	1.0	0.5	X	0.3	0.2	X	0.3
Construction	1.9	1.5	1.5	2.7	X	0.5	1.7	X	1.1
Manufacturing	157.9	157.2	202.9	259.1	298.0	219.1	265.7	300.2	284.4
Services	205.4	188.2	159.7	163.0	212.5	177.1	188.9	234.9	266.0
Total	508.8	490.6	523.8	545.5	618.1	490.5	592.5	704.0	694.2

1. North American Industry Classification System

Table 46 – BERD by major NAICS¹ industry – British Columbia

Industry	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^B
	in millions of \$								
Agriculture, forestry, fishing and hunting	12.9	11.5	10.6	15.1	11.0	14.9	19.7	23.4	17.3
Mining and oil and gas extraction	10.9	15.6	X	12.8	12.4	10.8	X	16.9	X
Utilities	X	X	5.5	5.3	5.2	X	X	5.6	X
Construction	X	X	X	2.1	5.4	X	9.1	5.0	2.3
Manufacturing	236.7	261.2	267.2	280.7	322.5	407.0	572.5	571.0	412.4
Services	322.4	306.7	246.4	247.7	251.8	266.3	348.0	443.1	526.1
Total	590.5	602.3	538.1	563.9	608.3	713.7	971.3	1,065.1	979.1

1. North American Industry Classification System

R&D personnel by industry and by region

Table 47 – Total R&D personnel by industry – Canada¹, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	721	309	782	321	729	287	732	316	655	285
Mining and oil and gas extraction	1,187	661	1,304	723	1,184	641	886	507	802	444
Utilities	1,351	740	1,331	748	1,404	765	1,178	687	954	583
Construction	563	317	514	272	466	261	404	245	419	236
Manufacturing	43,040	25,897	45,181	27,405	46,010	28,442	49,490	31,581	51,321	32,884
Services	32,021	18,935	32,900	19,506	29,551	18,103	30,003	18,656	31,834	20,285
Total	78,883	46,859	82,012	48,975	79,344	48,499	82,693	51,992	85,985	54,717

Table 47 (continued) – Total R&D personnel by industry – Canada¹, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	754	320	807	359	905	405	812	328
Mining and oil and gas extraction	775	403	730	385	846	395	606	316
Utilities	961	588	1,005	582	924	520	872	492
Construction	545	302	727	456	941	559	597	287
Manufacturing	53,431	34,274	60,575	39,525	59,278	38,000	52,479	33,203
Services	34,421	22,136	40,187	25,855	48,775	31,483	45,384	28,979
Total	90,887	58,023	104,031	67,162	111,669	71,362	100,750	63,605

1. Canada totals include the Territories

Table 48 – R&D personnel by industry – Atlantic Canada, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	62	30	76	23	79	29	64	34	51	22
Mining and oil and gas extraction	19	9	25	13	11	8	6	4	18	13
Utilities	2	2	2	2	2	2	2	2	12	7
Construction	9	6	15	6	7	6	8	4	10	4
Manufacturing	634	284	688	307	720	339	723	366	970	477
Services	904	575	1,037	631	887	484	816	479	791	433
Total	1,630	906	1,843	982	1,706	868	1,619	889	1,852	956

Table 48 (continued) – R&D personnel by industry – Atlantic Canada, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	44	19	55	19	37	12	26	9
Mining and oil and gas extraction	11	10	20	12	14	10	16	12
Utilities	13	6	77	29	45	18	21	9
Construction	11	3	35	12	46	14	41	12
Manufacturing	840	415	817	424	762	347	602	285
Services	863	514	1,011	604	1,048	672	763	501
Total	1,782	967	2,015	1,100	1,952	1,073	1,469	828

Table 49 – R&D personnel by industry – Quebec, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	155	70	170	82	195	83	207	95	241	120
Mining and oil and gas extraction	158	72	188	94	116	73	79	59	42	23
Utilities	847	485	871	501	850	488	744	437	695	432
Construction	210	119	166	86	180	88	168	100	184	103
Manufacturing	13,153	7,384	13,832	7,501	14,398	8,081	14,790	8,344	15,368	8,710
Services	9,208	5,345	10,086	5,940	10,653	6,335	10,596	6,335	11,462	7,115
Total	23,731	13,475	25,313	14,204	26,392	15,148	26,584	15,370	27,992	16,503

Table 49 (continued) – R&D personnel by industry – Quebec, total and professional

Industry	1999		2000		2001		2002 ^P	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	244	108	322	142	383	168	385	154
Mining and oil and gas extraction	46	25	29	16	30	14	17	8
Utilities	675	416	673	417	720	419	691	391
Construction	255	129	283	134	348	199	304	147
Manufacturing	16,255	9,060	18,757	10,709	18,257	9,628	17,088	9,336
Services	13,019	8,150	14,904	9,330	18,521	11,291	17,739	10,704
Total	30,494	17,888	34,968	20,748	38,259	21,719	36,224	20,740

Table 50 – R&D personnel by industry – Ontario, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	260	93	233	87	227	59	195	65	163	52
Mining and oil and gas extraction	162	68	177	94	196	80	174	86	201	105
Utilities	440	215	382	207	451	217	345	186	156	80
Construction	199	111	207	107	155	92	150	91	116	72
Manufacturing	24,056	15,367	25,112	16,427	25,394	16,786	28,330	19,590	29,013	20,069
Services	13,709	8,320	14,142	8,319	11,996	7,609	12,710	8,268	13,273	9,000
Total	38,826	24,174	40,253	25,241	38,419	24,843	41,904	28,286	42,922	29,378

Table 50 (continued) – R&D personnel by industry – Ontario, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	189	70	145	73	198	85	192	63
Mining and oil and gas extraction	172	86	175	97	212	131	83	47
Utilities	174	94	140	60	92	42	94	54
Construction	157	110	267	228	409	288	153	76
Manufacturing	30,219	20,851	33,897	23,798	32,775	23,320	29,262	20,124
Services	13,877	9,330	16,485	11,133	20,213	13,979	18,246	12,547
Total	44,788	30,541	51,109	35,389	53,899	37,845	48,030	32,911

Table 51 – R&D personnel by industry – Manitoba and Saskatchewan, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	38	12	64	15	49	23	56	28	43	21
Mining and oil and gas extraction	42	24	42	25	37	18	53	32	27	15
Utilities	19	13	26	11	27	12	20	17	22	19
Construction	22	12	16	8	13	7	10	6	6	2
Manufacturing	1,063	505	1,189	575	930	426	867	413	947	459
Services	1,099	550	995	526	908	437	909	439	894	433
Total	2,283	1,116	2,332	1,160	1,964	923	1,915	935	1,939	949

Table 51 (continued) – R&D personnel by industry – Manitoba and Saskatchewan, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	36	14	53	26	42	21	31	15
Mining and oil and gas extraction	31	16	26	16	43	18	36	13
Utilities	19	16	28	23	19	16	19	16
Construction	5	2	16	5	7	3	24	15
Manufacturing	1,190	682	1,264	653	1,433	594	1,040	496
Services	962	494	962	492	923	500	839	472
Total	2,243	1,224	2,349	1,215	2,467	1,152	1,989	1,027

Table 52 – R&D personnel by industry – Alberta, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	45	23	61	23	41	22	30	15	25	12
Mining and oil and gas extraction	675	421	725	429	789	445	467	280	423	244
Utilities	12	11	9	8	9	8	7	6	4	4
Construction	36	18	31	18	30	19	33	22	50	19
Manufacturing	1,459	741	1,511	877	1,613	938	1,928	1,149	1,974	1,221
Services	2,588	1,634	2,447	1,536	2,074	1,282	1,902	1,133	2,228	1,326
Total	4,815	2,848	4,784	2,891	4,556	2,714	4,367	2,605	4,704	2,826

Table 52 (continued) – R&D personnel by industry – Alberta, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	50	21	45	23	47	32	43	22
Mining and oil and gas extraction	423	220	372	177	456	176	389	208
Utilities	4	2	5	2	6	2	2	1
Construction	13	5	26	13	32	20	19	12
Manufacturing	1,570	1,107	1,641	1,120	1,728	1,144	1,491	1,059
Services	2,247	1,421	2,453	1,508	2,918	1,733	2,848	1,697
Total	4,307	2,776	4,542	2,841	5,187	3,107	4,792	2,999

Table 53 – R&D personnel by industry – British Columbia, total and professional

Industry	1994		1995		1996		1997		1998	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents										
Agriculture, forestry, fishing and hunting	158	80	177	91	138	71	180	79	132	58
Mining and oil and gas extraction	131	67	147	68	35	17	107	46	91	44
Utilities	31	14	41	19	65	38	60	39	65	41
Construction	86	51	78	47	81	49	35	22	53	36
Manufacturing	2,657	1,608	2,830	1,711	2,948	1,870	2,850	1,719	3,041	1,942
Services	4,463	2,485	4,185	2,550	3,030	1,954	3,062	1,998	3,178	1,974
Total	7,526	4,305	7,458	4,486	6,297	3,999	6,294	3,903	6,560	4,095

Table 53 (continued) – R&D personnel by industry – British Columbia, total and professional

Industry	1999		2000		2001		2002 ^a	
	Total	Prof.	Total	Prof.	Total	Prof.	Total	Prof.
full time equivalents								
Agriculture, forestry, fishing and hunting	191	88	187	76	197	87	135	65
Mining and oil and gas extraction	92	46	108	67	91	46	65	28
Utilities	76	54	82	51	42	23	45	21
Construction	104	53	100	64	99	35	56	25
Manufacturing	3,350	2,154	4,194	2,818	4,319	2,967	2,996	1,903
Services	3,452	2,226	4,372	2,790	5,152	3,308	4,948	3,058
Total	7,265	4,621	9,043	5,866	9,900	6,466	8,245	5,100

Table 54 – Total R&D personnel by country of control

Region / Country of control		1994	1995	1996	1997	1998	1999	2000	2001	2002 ¹
		full time equivalents								
Canada ¹	Canada	61,427	63,779	60,886	62,650	64,888	68,913	80,297	86,972	76,243
	Foreign	17,456	18,233	18,458	20,043	21,097	21,974	23,734	24,697	24,507
	Total	78,883	82,012	79,344	82,693	85,985	90,887	104,031	111,669	100,750
Atlantic Canada	Canada	1,523	1,690	1,586	1,454	1,608	1,626	1,781	1,713	1,254
	Foreign	107	153	120	185	244	156	234	239	215
	Total	1,630	1,843	1,706	1,619	1,852	1,782	2,015	1,952	1,469
Quebec	Canada	19,476	20,737	20,710	20,328	21,459	23,899	26,804	29,756	27,812
	Foreign	4,255	4,576	5,682	6,256	6,533	6,595	8,164	8,503	8,412
	Total	23,731	25,313	26,392	26,584	27,992	30,494	34,968	38,259	36,224
Ontario	Canada	28,207	29,917	28,546	30,510	30,942	31,709	38,288	41,305	34,647
	Foreign	10,619	10,336	9,873	11,394	11,980	13,079	12,821	12,594	13,383
	Total	38,826	40,253	38,419	41,904	42,922	44,788	51,109	53,899	48,030
Manitoba & Saskatchewan	Canada	1,935	1,879	1,665	1,641	1,700	1,940	1,955	2,068	1,717
	Foreign	348	453	299	274	239	303	394	399	272
	Total	2,283	2,332	1,964	1,915	1,939	2,243	2,349	2,467	1,989
Alberta	Canada	4,268	4,277	3,955	3,755	3,919	3,605	3,860	4,430	4,061
	Foreign	547	507	601	612	785	702	682	757	731
	Total	4,815	4,784	4,556	4,367	4,704	4,307	4,542	5,187	4,792
British Columbia	Canada	5,946	5,250	4,416	4,952	5,244	6,126	7,604	7,695	6,751
	Foreign	1,580	2,208	1,881	1,342	1,316	1,139	1,439	2,205	1,494
	Total	7,526	7,458	6,297	6,294	6,560	7,265	9,043	9,900	8,245

1. Canada totals include the Territories

Table 55 – Total R&D personnel, by employment size – Canada¹

Employment size ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person -years	full time equivalents								
0 – 9	9,107	8,593	7,747	7,235	7,174	7,282	8,283	9,250	7,895
10 – 19	5,988	5,929	4,924	4,793	4,978	5,550	6,116	7,415	6,276
20 – 49	8,479	8,936	8,129	8,129	9,071	10,121	12,014	13,658	11,970
50 – 99	6,296	6,865	6,617	7,034	7,976	7,855	10,055	11,997	10,222
100 – 199	6,306	6,869	7,084	8,059	7,668	8,757	10,468	11,967	10,389
200 – 499	6,652	6,993	7,294	7,811	8,522	10,184	10,315	11,058	10,517
500 – 999	5,713	7,251	7,133	6,994	7,208	5,485	8,933	10,306	8,021
1,000 – 1,999	6,121	5,993	6,717	6,579	7,715	9,839	9,555	9,717	11,623
2,000 – 4,999	5,761	5,991	5,709	5,915	6,538	8,248	8,127	7,329	7,439
> 4,999	18,460	18,592	17,990	20,144	19,135	17,566	20,165	18,972	15,798
Total	78,883	82,012	79,344	82,693	85,985	90,887	104,031	111,669	100,750

1. Canada totals include the Territories

2. Employment size is based on total employment in Canada

Table 56 – Total R&D personnel, by employment size – Atlantic Canada

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
person- years	full time equivalents								
0 – 9	337	392	398	346	358	348	328	324	170
10 – 19	186	237	191	169	182	249	254	196	113
20 – 49	332	334	349	390	435	339	458	393	357
50 – 99	142	253	229	239	305	194	238	293	172
100 – 199	99	91	135	204	168	323	329	242	179
200 – 499	100	92	48	87	126	157	105	216	198
500 – 999	33	26	55	69	100	16	119	86	103
1,000 – 1,999	51	41	22	42	53	39	94	103	27
> 1,999	350	377	279	73	125	117	90	99	150
Total	1,630	1,843	1,706	1,619	1,852	1,782	2,015	1,952	1,469

1. Employment size is based on total employment in Canada

Table 57 – Total R&D personnel, by employment size – Quebec

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ²
person- years	full time equivalents								
0 – 9	2,882	3,005	2,993	2,794	2,735	2,747	3,174	3,505	3,429
10 – 19	2,014	2,121	2,054	1,902	2,119	2,118	2,154	2,831	2,499
20 – 49	2,561	2,895	3,038	2,932	3,483	4,060	4,471	5,095	4,594
50 – 99	1,770	2,065	2,230	2,029	2,483	2,396	3,130	4,192	3,939
100 – 199	1,793	1,991	2,079	2,285	2,248	2,705	3,046	3,453	3,257
200 – 499	2,758	1,975	2,098	2,111	2,084	2,996	3,552	3,578	3,590
500 – 999	1,718	3,258	2,854	2,928	3,312	2,378	3,766	4,505	3,215
1,000 – 1,999	1,873	1,537	2,160	2,532	2,737	4,276	2,545	2,947	4,915
2,000 – 4,999	2,263	2,243	2,534	2,308	2,194	2,389	3,885	3,200	1,725
> 4,999	4,099	4,223	4,352	4,763	4,597	4,429	5,245	4,953	5,061
Total	23,731	25,313	26,392	26,584	27,992	30,494	34,968	38,259	36,224

1. Employment size is based on total employment in Canada

Table 58 – Total R&D personnel, by employment size – Ontario

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ²
person- years	full time equivalents								
0 – 9	2,831	2,401	2,126	2,096	2,154	2,159	2,561	3,010	2,322
10 – 19	2,368	2,277	1,852	1,813	1,709	2,099	2,322	2,901	2,399
20 – 49	3,232	3,526	3,079	3,158	3,552	3,857	4,825	5,661	4,928
50 – 99	2,805	2,770	2,405	3,103	3,740	3,747	4,761	5,383	4,234
100 – 199	3,411	3,550	3,664	3,931	3,725	4,079	5,222	6,156	4,947
200 – 499	2,863	3,540	3,772	4,013	4,513	4,959	5,190	5,289	4,780
500 – 999	2,387	3,017	3,160	3,238	2,691	2,437	3,532	3,708	3,823
1,000 – 1,999	3,388	3,399	3,614	3,572	4,275	4,430	5,118	5,310	5,583
2,000 – 4,999	2,381	2,535	2,121	2,724	3,242	4,890	3,395	3,147	4,818
> 4,999	13,160	13,238	12,626	14,256	13,321	12,131	14,183	13,334	10,196
Total	38,826	40,253	38,419	41,904	42,922	44,788	51,109	53,899	48,030

1. Employment size is based on total employment in Canada

Table 59 – Total R&D personnel, by employment size – Manitoba and Saskatchewan

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
person- years	full time equivalents								
0 – 9	467	423	368	326	356	371	423	431	379
10 – 19	184	195	98	107	116	126	202	206	168
20 – 49	343	414	298	254	172	250	239	259	244
50 – 99	255	250	297	265	246	154	164	198	212
100 – 199	193	220	289	334	321	291	323	203	134
200 – 499	371	249	152	193	176	273	200	514	233
500 – 999	179	178	131	122	138	314	332	350	395
1,000 – 1,999	163	233	203	217	160	57	272	186	106
2,000 – 4,999	105	160	115	92	243	194	158	110	108
> 4,999	23	10	13	5	11	213	36	10	10
Total	2,283	2,332	1,964	1,915	1,939	2,243	2,349	2,467	1,989

1. Employment size is based on total employment in Canada

Table 60 – Total R&D personnel, by employment size – Alberta

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
person- years	full time equivalents								
0 – 9	952	907	822	698	636	718	775	866	640
10 – 19	420	418	309	316	428	420	479	490	405
20 – 49	677	631	492	520	511	539	692	678	651
50 – 99	401	456	445	471	271	243	363	564	328
100 – 199	343	462	453	549	605	582	554	718	887
200 – 499	242	186	243	339	404	332	367	465	531
500 – 999	184	120	262	130	182	251	231	258	134
1,000 – 1,999	372	373	339	151	160	124	66	171	232
2,000 – 4,999	401	440	480	374	549	488	518	518	575
> 4,999	823	791	711	819	958	610	497	459	409
Total	4,815	4,784	4,556	4,367	4,704	4,307	4,542	5,187	4,792

1. Employment size is based on total employment in Canada

Table 61 – Total R&D personnel, by employment size – British Columbia

Employment size ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ²
person- years	full time equivalents								
0 – 9	1,614	1,452	1,037	970	926	935	1,020	1,113	954
10 – 19	787	671	418	485	417	534	702	787	692
20 – 49	1,320	1,134	870	875	918	1,076	1,329	1,572	1,196
50 – 99	920	1,070	1,011	927	931	1,121	1,399	1,367	1,337
100 – 199	467	554	464	756	601	777	994	1,195	985
200 – 499	316	949	981	1,068	1,219	1,467	901	996	1,185
500 – 999	1,212	652	671	503	785	89	953	1,399	951
1,000 – 1,999	274	410	379	65	330	913	1,460	1,000	760
2,000 – 4,999	262	263	189	345	213	191	98	303	119
> 4,999	354	303	277	300	220	162	187	168	66
Total	7,526	7,458	6,297	6,294	6,560	7,265	9,043	9,900	8,245

1. Employment size is based on total employment in Canada

Table 62 – Total R&D personnel by size of R&D expenditures – Canada¹

Size of R&D ²	1994	1995	1996	1997	1998	1999	2000	2001	2002 ²
in thousands of \$	full time equivalents								
0 – 24	2,785	2,577	2,443	2,386	2,131	2,031	1,982	1,968	1,459
25 – 49	1,888	1,855	1,758	1,643	1,742	1,697	1,741	1,840	1,440
50 – 99	3,073	3,137	2,817	2,694	2,752	2,730	3,113	3,374	2,607
100 – 199	4,808	4,776	4,138	4,143	4,384	4,688	5,424	5,738	4,505
200 – 399	5,764	5,993	5,342	5,283	5,554	6,228	6,886	7,544	5,609
400 – 999	7,753	8,087	6,274	6,598	7,362	8,146	10,530	11,345	8,621
1,000 – 1,999	5,778	6,429	6,601	6,554	6,582	7,544	8,514	9,588	8,942
2,000 – 9,999	12,784	13,681	13,317	14,356	16,277	16,268	18,630	21,236	20,573
> 9,999	34,320	35,477	36,654	39,036	39,201	41,527	47,009	49,030	49,994
Total	78,883	82,012	79,344	82,693	85,985	90,887	104,031	111,669	100,750

1. Canada total include the Territories

2. Size of R&D is based on total R&D expenditures in Canada

Table 63 – Total R&D personnel by size of R&D expenditures – Atlantic Canada

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	full time equivalents								
0 – 24	122	137	165	146	137	117	96	82	51
25 – 49	65	96	99	82	97	91	75	57	49
50 – 99	126	154	131	142	120	123	139	125	75
100 – 199	167	147	184	145	200	196	218	169	123
200 – 399	194	265	212	238	236	282	221	285	124
400 – 999	224	252	183	268	336	249	390	308	194
1,000 – 1,999	224	310	314	324	395	352	317	221	196
2,000 – 9,999	374	364	225	265	293	357	444	657	550
> 9,999	134	118	193	9	38	15	115	48	107
Total	1,630	1,843	1,706	1,619	1,852	1,782	2,015	1,952	1,469

1. Size of R&D is based on total R&D expenditures in Canada

Table 64 – Total R&D personnel by size of R&D expenditures – Quebec

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	full time equivalents								
0 – 24	949	933	897	1,028	1,011	946	919	947	755
25 – 49	707	694	763	724	768	772	831	920	780
50 – 99	1,133	1,229	1,215	1,184	1,177	1,228	1,426	1,569	1,360
100 – 199	1,740	1,827	1,683	1,656	1,714	1,834	2,220	2,357	2,006
200 – 399	1,875	2,146	2,187	1,918	1,956	2,360	2,476	2,858	2,243
400 – 999	2,471	2,637	2,647	2,359	2,633	2,918	3,583	3,743	2,993
1,000 – 1,999	1,623	1,743	2,158	1,969	2,080	2,548	2,573	3,122	3,018
2,000 – 9,999	2,843	3,148	3,014	3,431	4,153	4,625	5,269	6,667	7,181
> 9,999	10,390	10,956	11,828	12,315	12,500	13,263	15,671	16,076	15,888
Total	23,731	25,313	26,392	26,584	27,992	30,494	34,968	38,259	36,224

1. Size of R&D is based on total R&D expenditures in Canada

Table 65 – Total R&D personnel by size of R&D expenditures – Ontario

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
in thousands of \$	full time equivalents								
0 – 24	844	751	694	652	503	518	504	517	342
25 – 49	589	584	525	486	515	474	509	508	365
50 – 99	1,049	1,020	915	883	921	867	943	1,035	783
100 – 199	1,791	1,637	1,417	1,546	1,589	1,811	1,976	2,150	1,486
200 – 399	2,232	2,151	1,903	2,093	2,305	2,373	2,797	3,163	2,262
400 – 999	3,229	3,539	2,510	2,877	3,321	3,612	4,921	5,072	3,799
1,000 – 1,999	2,568	2,653	2,504	2,759	2,772	3,323	4,009	4,761	3,944
2,000 – 9,999	6,840	7,474	7,345	7,770	8,696	8,023	9,105	9,768	9,509
> 9,999	19,684	20,444	20,606	22,838	22,300	23,787	26,345	26,925	25,540
Total	38,826	40,253	38,419	41,904	42,922	44,788	51,109	53,899	48,030

1. Size of R&D is based on total R&D expenditures in Canada

Table 66 – Total R&D personnel by size of R&D expenditures – Manitoba and Saskatchewan

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^P
in thousands of \$	full time equivalents								
0 – 24	152	132	136	102	94	90	90	78	64
25 – 49	83	88	50	67	64	65	53	64	44
50 – 99	131	107	68	69	99	89	121	105	57
100 – 199	162	160	131	183	147	133	168	181	146
200 – 399	239	227	164	109	152	169	217	213	109
400 – 999	360	258	178	189	122	193	217	284	249
1,000 – 1,999	229	438	328	320	262	164	206	219	333
2,000 – 9,999	677	755	774	696	874	824	873	818	626
> 9,999	250	167	135	180	125	516	404	505	361
Total	2,283	2,332	1,964	1,915	1,939	2,243	2,349	2,467	1,989

1. Size of R&D is based on total R&D expenditures in Canada

Table 67 – Total R&D personnel by size of R&D expenditures – Alberta

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	full time equivalents								
0 – 24	285	251	239	190	179	168	160	148	111
25 – 49	166	160	131	133	122	133	126	143	73
50 – 99	236	218	183	176	178	183	211	212	145
100 – 199	328	381	343	246	323	287	370	398	284
200 – 399	467	453	356	381	461	514	541	418	347
400 – 999	571	517	297	360	404	422	602	666	464
1,000 – 1,999	368	586	559	450	402	326	294	526	677
2,000 – 9,999	798	612	788	856	839	828	918	904	985
> 9,999	1,596	1,606	1,660	1,575	1,796	1,446	1,320	1,772	1,706
Total	4,815	4,784	4,556	4,367	4,704	4,307	4,542	5,187	4,792

1. Size of R&D is based on total R&D expenditures in Canada

Table 68 – Total R&D personnel by size of R&D expenditures – British Columbia

Size of R&D ¹	1994	1995	1996	1997	1998	1999	2000	2001	2002 ^p
in thousands of \$	full time equivalents								
0 – 24	412	358	309	267	207	192	213	196	135
25 – 49	268	230	189	150	175	162	146	154	129
50 – 99	392	400	301	240	252	246	272	328	187
100 – 199	615	622	380	363	404	427	472	482	460
200 – 399	756	751	520	540	441	527	633	603	524
400 – 999	889	884	459	545	546	749	817	1,272	922
1,000 – 1,999	766	699	738	732	671	831	1,115	739	774
2,000 – 9,999	1,252	1,328	1,171	1,338	1,422	1,631	2,221	2,422	1,722
> 9,999	2,176	2,186	2,230	2,119	2,442	2,500	3,154	3,704	3,392
Total	7,526	7,458	6,297	6,294	6,560	7,265	9,043	9,900	8,245

1. Size of R&D is based on total R&D expenditures in Canada

Technical notes

Definitions

R&D personnel: calculated in full-time equivalent (FTE's). R&D may be carried out by persons who work solely on R&D projects or by persons who devote only part of their time to R&D, and the balance to other activities such as testing, quality control and production engineering. To arrive at the total effort devoted to R&D in terms of person-years, it is necessary to estimate the full-time equivalent (FTE's) of these persons working only part-time in R&D.

(FTE's) = number of persons who work solely on R&D projects + estimate of time of persons working only part of their time on R&D.

Example Calculation:

If out of five scientists engaged in R&D work, one works solely on R&D projects and the remaining four devote only one quarter of their working time to R&D, then: $(FTE's) = 1 + 1/4 + 1/4 + 1/4 + 1/4 = 2$ scientists.

Research and Development

Research and development (R&D) is systematic investigation carried out in the natural and engineering sciences by means of experiment or analysis to achieve a scientific or commercial advance.

Research is original investigation undertaken on a systematic basis to gain new knowledge.

Development is the application of research findings or other scientific knowledge for the creation of new or significantly improved products or processes. If successful, development will usually result in devices or processes which represent an improvement in the "state of the art" and are likely to be patentable.

Example:

The investigation of electrical conduction in crystals was research. The application of this knowledge to the creation of a new amplifying device - the transistor - was development. The application of the device to the construction of new electrical circuits for television receivers was development. The formulation of new plastic cases for a television receiver is design, not development.

Research and development may be carried out either by a permanent R&D unit (e.g., R&D division) or by a unit generally engaged in any non-R&D activity such as engineering or production. In the first case, the R&D unit may spend part of its time on routine testing or trouble shooting or on some other activities which should not be included in R&D. In the second, only the R&D portion of such units' total activity should be considered.

Research and development should be considered to be "Scientific Research and Experimental Development" as defined in Section 37, Regulation 2900 of the Income Tax Act; this section specifically **excludes** the following:

- (i) market research, sales promotion,
- (ii) quality control or routine analysis and testing of materials, devices or products,
- (iii) research in the social sciences or the humanities,
- (iv) prospecting, exploring or drilling for or producing minerals, petroleum or natural gas,
- (v) the commercial production of a new or improved material, device or product or the commercial use of a new or improved process,
- (vi) style changes, or routine data collection.

Note:

Although the definition of "Scientific Research and Experimental Development" is considered to be the same as R&D, certain expenditures for scientific research cannot be claimed for income tax purposes (e.g., land, building). All expenditures attributable to R&D are included in this report.

Industrial classification

The natural classification to use within the business enterprise sector is the North American Industry Classification System (NAICS). There are, however, problems with its use. A major problem is caused by companies with establishments in more than one industry (e.g., companies which both refine petroleum and extract oil). Another is caused by the concentration of the R&D activity among a few companies. In order to prevent disclosure of individual respondents many industries must be grouped together to provide sufficient observations for publication. A third problem is that the classification, chosen to represent general industrial activity, may not be entirely suitable for identifying companies chosen only for their involvement in R&D.

There are some restrictions on the application of the NAICS, for example, industrial non-profit organizations will be assigned to the industry they support.

The R&D activities of other sectors such as the federal government, provincial governments, higher education, and private non-profit organizations are covered in other reports.

Interpretation of R&D

Generally speaking, industrial R&D is intended to result in an invention which may subsequently become a technological innovation. An essential requirement is that the outcome of the work is uncertain, i.e., that the possibility of obtaining a given technical objective cannot be known in advance on the basis of current knowledge or experience. Hence much of the work done by scientists and engineers is not R&D, since they are primarily engaged in "routine" production, engineering, quality control or testing. Although they apply scientific or engineering principles their work is not directed towards the discovery of new knowledge or the development of new products and processes. However, work elements which are not considered R&D by themselves but which directly support R&D projects, should be included with R&D in these cases. Examples of such work elements are design and engineering, shop work, computer programming, and secretarial work.

If the primary objective is to make further technical improvements to the product or process, then the work comes within the definition of R&D. If however, the product, process or approach is substantially set and the primary objective is to develop markets, to do pre-production planning or to get a production or control system working smoothly, then the activity can no longer be considered as part of R&D even though it could be regarded as an important part of the total innovation process. Thus, the design, construction and testing of prototypes, models and pilot plants are part of R&D. But, when necessary modifications have been made and testing has been satisfactorily completed, the boundary of R&D has been reached. Hence, the costs of tooling (design and try-out), construction drawings and manufacturing blueprints, and production start-up are not included in development costs.

Pilot plants may be included in development only if the main purpose is to acquire experience and compile data. As soon as they begin operating as normal production units, their costs can no longer be attributed to R&D. Similarly, once the original prototype has been found satisfactory, the cost of other "prototypes" built to meet a special need or fill a very small order are not to be considered as part of R&D.

Specific cases and their treatment		
Activity	Treatment	Remarks
Economic research, market research, management studies.	Exclude	All activities in the social sciences.
Quality control, routine testing, style changes, minor adaptation of a product to meet a customer's specific requirements.	Exclude	Even if carried out by staff normally engaged in R&D.
Prospecting, exploratory drilling, development of mines, oil or gas wells.	Exclude	Except for R&D projects concerned with new equipment or techniques in these activities, such as in-situ and tertiary recovery research.
Engineering	Exclude	Engineering unless it is in direct support of R&D.
Design and drawing	Exclude	Design and drawing unless it is in direct support of R&D.
Prototypes, pilot plants	Include	As long as the primary objective is to make further improvements.
Contracts for R&D	Include	All contracts for R&D. For contracts which include other work, report only the R&D costs.
Tooling up, trial production, trouble shooting	Exclude	Although R&D may be required as a result of these steps.
Patent and license work	Exclude	All administrative and legal work connected with patents and licenses.

Reliability of the data

All the possible sources of error are examined below. Definitions have been taken from **A Compendium of Methods of Error Evaluation in Censuses and Surveys**, Statistics Canada, Catalogue No. 13-564.

Coverage

"Coverage errors are introduced whenever the sampling frame...does not adequately represent the target population at the time of the survey."

Coverage is a minor source of error. Surveys are of all known and suspected, large R&D establishments and funders (R&D $\geq$ \$1,000,000).

Administrative data are used for the small R&D establishments or funders. Companies have up to 18 months after their fiscal year end to claim a tax credit for their R&D expenditures; however, we estimate under reporting to be less than 6%.

Response

"A response error occurs whenever a characteristic is misreported in a census or a survey."

As a result of a reconciliation of federal and industrial accounts of government grants and contracts, we think that industrial R&D performance estimates may be slightly low. This is caused by the non-reporting of industrial R&D funded by contract. Such work is sometimes not distinguishable from non-R&D contract work.

The accuracy of the company's estimates of future expenditures has also been a problem in the past, particularly in the wells and petroleum products industries.

Non-Response

"Non-response occurs when information required for a survey unit is missing. This could happen because the unit cannot be contacted, because the unit is unable to provide the information requested, or because the unit refuses to cooperate in the survey."

Non-response is a potential problem in four areas. One is the estimate of R&D expenditures two years past the base year. If no estimate is made, editors make one - based usually on the expenditure of the preceding year or a slight increase in expenditures.

The second involves the administrative data used for the smaller R&D establishments. These represent less than 9% of all R&D performed by businesses. Certain information is not asked of them. However, the missing data are imputed from the replies of the larger establishments in the same industry.

The third concerns companies inadvertently not included in the survey. A number of sources are used to create the mailing lists and it is unlikely that major establishments would be overlooked.

Failure of surveyed companies to reply is the fourth type of non-response. We believe non-response error to be minor and may result in a minor under-estimation of R&D expenditures.

Coding

"A coding operation in a survey or census is defined as the operation where data on questionnaires or source documents are transformed into a format which is suitable for input to the data capture operation. This often involves the assignment of codes for 'write-in' entries but may also be a fairly straightforward transcription operation."

Uncorrected coding errors are unlikely because of the examination of numerous tables and listings prepared for data analysis before publication tables are created.

Data Capture

"The data capture operation in a census or survey consists of converting the data received on questionnaires (e.g., respondent answers) to a machine readable format."

All data capture for science statistics is through manual intervention: key-edit or typed entry at a computer terminal.

Significant uncorrected data capture errors are unlikely because of the examination of numerous tables and listings prepared for data analysis before publication tables are created.

Edit and Imputation

"The edit procedure usually consists of: (i) checking each field of every record to ascertain whether it contains a valid code or entry; (ii) checking codes or entries in certain predetermined combinations of fields to ascertain whether codes or entries are consistent with one another... The imputation procedure consists of changing values in some of the fields in records which failed the edit rules with a view to ensuring that the resultant data records satisfy all edit rules".

Although there are a number of edits, all cases of failed edit checks are corrected after consideration by editors. Automatic imputations are made only for the smaller R&D establishments and funders.

Sampling

"Sampling error occurs whenever survey results are based on a sample of units from a survey frame... Obviously there is no sampling error in complete enumeration surveys."

Although a complete enumeration is carried out of known and suspected R&D establishments and funders, records received from the administrative data do not provide as much information as do those completing the long form. Certain data are imputed for records from the administrative file based on the patterns of long form respondents in the same industry. Thus, as a result of the 2002 survey, the 2002 business enterprise sector R&D expenditures would be based on full enumeration but about 10% of the expenditures for 2003 and 2004 would have been imputed.

How to obtain more information

For information on the wide range of data available from Statistics Canada, you can contact us by calling one of our toll-free numbers. You can also contact us by e-mail or by visiting our website.

National inquiries line	1 800 263-1136
National telecommunications device for the hearing impaired	1 800 363-7629
Depository Services Program inquiries	1 800 700-1033
Fax line for Depository Services Program	1 800 889-9734
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